



**UNITED STATES**  
**NUCLEAR REGULATORY COMMISSION**

REGION II  
SAM NUNN ATLANTA FEDERAL CENTER  
61 FORSYTH STREET, SW, SUITE 23T85  
ATLANTA, GA 30303-8931

July 30, 2007

Duke Power Company, LLC  
d/b/a Duke Energy Carolinas, LLC  
ATTN: Mr. J. R. Morris  
Site Vice President  
Catawba Nuclear Station  
4800 Concord Road  
York, SC 29745

SUBJECT: CATAWBA NUCLEAR STATION - NRC INTEGRATED INSPECTION REPORT  
05000413/2007003 AND 05000414/2007003

Dear Mr. Morris:

On June 30, 2007, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at your Catawba Nuclear Station Units 1 and 2. The enclosed inspection report documents the inspection results, which were discussed on July 13, 2007, with Mr. George Hamrick and other members of your staff.

The inspection examined activities conducted under your licenses as they relate to safety and compliance with the Commission's rules and regulations and with the conditions of your licenses. The inspectors reviewed selected procedures and records, observed activities, and interviewed personnel.

This report documents five NRC-identified findings of very low safety significance (Green) which were determined to be violations of NRC requirements. However, because of their very low safety significance and because they were entered into your corrective action program, the NRC is treating these findings as non-cited violations (NCVs) consistent with Section VI.A of the NRC Enforcement Policy. If you contest any non-cited violation, you should provide a written response within 30 days of the date of this inspection report, with the basis for your denial, to the Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, D.C. 20555-0001; with copies to the Regional Administrator, Region II; the Director, Office of Enforcement, United States Nuclear Regulatory Commission, Washington, D.C. 20555-0001; and the NRC Resident Inspector at the Catawba facility.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter and its enclosure will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of NRC's document system (ADAMS).

ADAMS is accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html> (the Public Electronic Reading Room).

Sincerely,

**/RA/**

James H. Moorman, III, Chief  
Reactor Projects Branch 1  
Division of Reactor Projects

Docket Nos.: 50-413, 50-414  
License Nos.: NPF-35, NPF-52

Enclosure: Integrated Inspection Report 05000413/2007003 and 05000414/2007003  
w/Attachment: Supplemental Information

cc w/encl: (See page 3)

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Letter to J. R. Morris from James H. Moorman, III dated July 30, 2007

SUBJECT: CATAWBA NUCLEAR STATION - NRC INTEGRATED INSPECTION REPORT  
05000413/2007003 AND 05000414/2007003

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**U. S. NUCLEAR REGULATORY COMMISSION**

**REGION II**

Docket Nos.: 50-413, 50-414

License Nos.: NPF-35, NPF-52

Report No.: 05000413/2007003 and 05000414/2007003

Licensee: Duke Power Company, LLC

Facility: Catawba Nuclear Station, Units 1 and 2

Location: York, SC 29745

Dates: April 1, 2007 through June 30, 2007

Inspectors: A. Sabisch, Senior Resident Inspector  
G. Williams, Resident Inspector

Approved by: James H. Moorman, III, Chief  
Reactor Projects Branch 1  
Division of Reactor Projects

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## SUMMARY OF FINDINGS

IR 05000413/2007003, 05000414/2007003; 04/01/2007 - 06/30/2007; Catawba Nuclear Station, Units 1 and 2; Maintenance Risk Assessment, Permanent Plant Modifications.

The report covered a three-month period of inspection by two resident inspectors. Five Green findings (all of which were non-cited violations) were identified. The significance of most findings is indicated by their color (Green, White, Yellow, Red) using IMC 0609, "Significance Determination Process" (SDP). Findings for which the SDP does not apply may be Green or be assigned a severity level after NRC management review. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," (ROP) Revision 4, dated December 2006.

### A. NRC-Identified and Self-Revealing Findings

#### Cornerstone: Mitigating Systems

- Green: Inspectors identified a non-cited violation (NCV) of 10 CFR 50.65(a)(4) for the licensee's failure to effectively implement the risk mitigation actions contained in the approved Critical Evolution Plan associated with work on the Unit 2 B Train Component Cooling Water (KC) heat exchanger to manage and minimize the resulting increased plant risk. Specifically, during the cleaning of the Unit 2 B Train KC heat exchanger tubes, the offsite power supply was not protected and in fact, work was conducted within the switchyard's protective fence. This issue has been entered into the licensee's corrective action program as Problem Investigation Process report (PIP) C-07-2025.

This finding was more than minor because it was associated with the Equipment Performance attribute of the Mitigating Systems cornerstone and affected the cornerstone objective of ensuring the availability, reliability and capability of systems that respond to initiating events to prevent undesirable consequences is maintained. The inspectors completed a Phase 1 screening of the finding using Appendix K of the Inspection Manual Chapter 0609, "Maintenance Risk Assessment and Risk Significance Determination Process," and determined that the performance deficiency represented a finding of very low safety significance based on the resulting magnitude of the calculated Incremental Core Damage Probability associated with the work being performed in the switchyard in conjunction with the 2B KC heat exchanger tube cleaning being less than 1E-6. The finding directly involved the cross-cutting area of Human Performance under the "Work Activity Coordination" aspect of the "Work Control" component, in that the licensee failed to appropriately coordinate work activities to ensure the operational impact of the planned work was controlled and the increased risk minimized in accordance with the approved Critical Evolution Plan associated with the cleaning of the Unit 2 B train KC heat exchanger (H.3.b). (Section 1R13b.(1))

- Green: Inspectors identified a NCV of 10 CFR 50.65(a)(4) for the licensee's failure to develop and implement an effective Complex Evolution Plan associated with excavation and inspection of the nuclear service water (RN) supply headers in order to manage and minimize the risk associated with the activity. Specifically, during the

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excavation phase of the activity, the potential of damaging the RN headers was not adequately controlled to minimize the increased risk resulting from the excavation. This issue has been entered into the licensee's corrective action program as PIP C-07-2079.

This finding was more than minor because it was associated with the Equipment Performance attribute of the Mitigating Systems cornerstone and affected the cornerstone objective of ensuring the availability, reliability and capability of systems that respond to initiating events to prevent undesirable consequences is maintained. The inspectors completed a Phase 1 screening of the finding using Appendix K of Inspection Manual Chapter 0609, "Maintenance Risk Assessment and Risk Significance Determination Process," and determined that the performance deficiency represented a finding of very low safety significance because in the event an RN supply header was damaged during the excavation, the licensee could complete repairs to the header within the TS allowable out-of-service time of 72 hours. The finding directly involved the cross-cutting area of Human Performance under the "Supervisory and Management Oversight" aspect of the "Work Practices" component, in that the licensee failed to ensure that the appropriate level of supervisory oversight was provided during the excavation phase to ensure the expectations pertaining to the use of mechanized equipment when digging in close proximity to the RN supply headers were properly implemented (H.4.c). (Section 1R13b.(2))

#### Cornerstone: Barrier Integrity

- Green: Inspectors identified a NCV of 10 CFR 50, Appendix B, Criterion III, Design Control, for the licensee's failure to effectively design and implement a modification that replaced the containment hydrogen igniter system's glow plugs with upgraded glow coils to ensure the system's operability was maintained. Specifically, following the installation of the hydrogen igniter glow coils in both units, certain breakers and fuses in the individual igniter circuits were found to be undersized, resulting in breakers tripping and fuses failing when called upon to provide power to the igniters for extended periods. The licensee implemented corrective actions to restore the HIS on both units to full operability. This issue has been entered into the licensee's corrective action program as PIPs C-06-8562 and C-06-8742.

This finding was more than minor because it was associated with the Design Control attribute of the Barrier Integrity cornerstone and affected the cornerstone objective of providing reasonable assurance that a physical design barrier (i.e., containment) would protect the public from radio nuclide releases caused by accidents or events. The inspectors determined the finding to be of very low safety significance using Manual Chapter 0609, Appendix H, Containment Integrity Significance Determination Process, Phase 2, based on the under-rated breakers or fuses not resulting in the loss of coverage in two adjacent areas inside of containment. (Section 1R17b.(1))

- Green: Inspectors identified a NCV of 10 CFR 50, Appendix B, Criterion XI, Test Control, for the licensee's failure to ensure that surveillance procedures were adequate to verify the operability of the newly-installed hydrogen igniter glow coils on Catawba Units 1 and 2. Specifically, following the installation of the hydrogen igniter glow coils, the voltage for several igniters was set below the required value to ensure the temperature specified in the TS was obtained due to an inadequate surveillance

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procedure. The licensee implemented corrective actions to restore the hydrogen ignition system on both units to full operability. This issue has been entered into the licensee's corrective action program as PIP C-06-8562.

The finding was more than minor because it was associated with the Procedure Quality attribute of the Barrier Integrity cornerstone and affected the cornerstone objective of providing reasonable assurance that a physical design barrier (i.e., containment) would protect the public from radio nuclide releases caused by accidents or events. The inspectors determined the finding to be of very low safety significance using the Phase 1 Screening Worksheet of Inspection Manual Chapter 0609, "Maintenance Risk Assessment and Risk Significance Determination Process" based on the actual temperatures of the affected hydrogen igniters being above the value that was subsequently shown to result in hydrogen ignition. The finding directly involved the cross-cutting area of Human Performance under the "Complete and Accurate Procedures" aspect of the "Resources" component, in that the licensee failed to develop an adequate surveillance procedure to ensure voltages on hydrogen igniter glow coil circuits would produce temperatures that met the acceptance criteria specified in the TS (H.2.c). (Section 1R17b.(2))

#### Cornerstone: Initiating Events

- Green: Inspectors identified a NCV of 10 CFR 50, Appendix B, Criterion III, Design Control, for the licensee's failure to effectively implement the requirement to fully inspect fuel handling cask crane welds in accordance with Updated Final Safety Analysis Report (UFSAR) Section 9.1.4.2.3 following reinforcements made in response to a Part 21 notification. Following implementation of the modification to restore the fuel handling cask crane's capacity to 125 tons, the licensee had performed visual weld inspections rather than magnetic particle or liquid penetrant testing as required by the UFSAR. The licensee performed the required inspections prior to actual use of the cranes to lift loaded spent fuel casks. This issue has been entered into the licensee's corrective action program as PIP C-07-2028.

This finding was more than minor because if left uncorrected it could become a more significant safety concern in that improperly performed inspections on fuel handling equipment could impact the safe movement of nuclear fuel and increase the probability of a fuel handling accident. This finding is associated with the Equipment Performance attribute of the Initiating Events cornerstone and affected the cornerstone objective of limiting the likelihood of an event that could challenge critical safety functions during spent fuel movement. The finding is not suitable for SDP evaluation, but has been reviewed by NRC management and was determined to be a finding of very low safety significance (Green) because the affected welds on the fuel handling cask cranes were properly inspected prior to lifting fully loaded fuel casks in the spent fuel pool building. This finding directly involved the cross-cutting area of Problem Identification and Resolution under the "Operating Experience Evaluation" aspect of the "Operating Experience" component, in that the licensee failed to properly evaluate the Part 21 notification received from Whiting Corporation to ensure all testing requirements were identified prior to implementing the required modification and declaring the cranes fully operable (P.2.a). (Section 1R17b.(3))

B. Licensee-Identified Violations

None

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## **Report Details**

### **Summary of Plant Status**

Unit 1 began the inspection period at 100 percent rated thermal power (RTP) and remained there for the duration of the inspection period.

Unit 2 began the inspection period at 100 percent RTP and operated there until June 9, 2007, when power was reduced to 18 percent to repair two main feedwater isolation valves. The unit returned to full power on June 10, 2007, and remained there for the duration of the inspection period.

#### **1. REACTOR SAFETY**

Cornerstones: Initiating Events, Mitigating Systems, Barrier Integrity

##### **1R01 Adverse Weather Protection**

###### **.1 Seasonal Weather Preparation**

###### **a. Inspection Scope**

The inspectors reviewed the licensee's preparations for adverse weather associated with high ambient temperatures. This included field walkdowns to assess the material condition and operation of ventilation and cooling equipment, as well as other preparations made to protect plant equipment from high ambient temperature conditions. Risk-significant systems reviewed included the standby shutdown facility, portions of the auxiliary building, and the nuclear service water pump house structure. In addition, the inspectors conducted discussions with operations, engineering, and maintenance personnel responsible for implementing Catawba's hot weather preparation program to assess the licensee's ability to identify and resolve deficient conditions associated with hot weather protection equipment prior to actual hot weather being experienced at the site. The documents reviewed during this inspection are listed in the Attachment to this report.

###### **b. Findings**

No findings of significance were identified.

##### **1R04 Equipment Alignment**

###### **.1 Partial Walkdowns**

###### **a. Inspection Scope**

The inspectors determined if the critical portions of equipment alignments for selected trains remained operable while the redundant trains were inoperable. The inspectors reviewed plant documents to determine the correct system and power alignments, and the required positions of select valves and breakers. The inspectors determined if the licensee had properly identified and resolved equipment alignment problems that could cause initiating events or impact mitigating system availability. The inspectors walked

down the nine partial system alignments listed below. The documents reviewed during this inspection are listed in the Attachment to this report.

- 2B diesel generator (DG) while the 2A DG was removed from service for inspection of the connecting rod journal bearings
- 1B DG when 1A DG was declared inoperable due to an overheated linear reactor transformer during an operability run
- Protection of A and B train equipment that could be affected by the actual excavation activities or results of the external inspections conducted on the “A” RN supply header south of Manway #8
- Protection of the A train Control Area Chilled Water (YC) and Unit 2 Train A 4.16kV vital bus (2ETA) switchgear with the B train of YC out of service for planned maintenance
- Protection of applicable A train equipment when Unit 2 was in an Orange risk condition due to cleaning of the 2B KC heat exchanger
- Protection of designated B train equipment when Unit 1 was in an Orange risk condition due to cleaning of the 1A KC heat exchanger
- Protection of designated equipment when the 1A Main Transformer normal feeder breaker to Bank “A” cooling fans was replaced and temporary power to the fans was utilized
- Protection of the “F” Instrument Air (VI) air dryer skid with the “E” VI air dryer skid out of service following a failure of the control panel
- Protection of selected “B” train components in support of the cleaning of the 2A KC heat exchanger tubes

b. Findings

No findings of significance were identified.

.2 Complete Walkdown

a. Inspection Scope

The inspectors conducted one detailed walkdown/review involving the alignment and condition of the Unit 1 KC system. The inspectors utilized licensee procedures, as well as licensing and design documents to verify that the system (i.e., pump, valve, and electrical) alignment was correct. During the walk downs, the inspectors also verified that: valves and pumps did not exhibit leakage that would impact their function; major portions of the system and components were correctly labeled; hangers and supports were correctly installed and functional; and essential support systems were operational. In addition, pending design and equipment issues were reviewed to determine if the identified deficiencies significantly impacted the system’s functions. Items included in this review were: the operator workaround list, the temporary modification list, system Health Reports, and outstanding maintenance work requests/work orders. A review of open PIPs was also performed to verify that the licensee had appropriately characterized and prioritized KC-related equipment problems for resolution in the corrective action program. The documents reviewed during this inspection are listed in the Attachment to this report.

b. Findings

No findings of significance were identified.

1R05 Fire Protection

a. Inspection Scope

The inspectors walked down accessible portions of the plant to assess the licensee's control of transient combustible material and ignition sources, fire detection and suppression capabilities, fire barriers, and any related compensatory measures. The inspectors observed the fire protection suppression and detection equipment to determine whether any conditions or deficiencies existed which could impair the operability of that equipment. The inspectors selected the areas based on a review of the licensee's safe shutdown analysis, probabilistic risk assessment based on sensitivity studies for fire related core damage accident sequences, and summary statements related to the licensee's 1992 Initial Plant Examination for External Events Submittal to the NRC. The inspectors toured the eight areas important to reactor safety listed below. The documents reviewed during this inspection are listed in the Attachment to this report.

- Unit 1 B Train 4160kV switchgear, 1ETB; Auxiliary Building 560 foot elevation
- Unit 2 577 foot elevation, Room 400
- Unit 1 Electrical Penetration Room & Reactor Trip Breaker Area; Auxiliary Building 594 foot elevation, Room 576
- Unit 2 Mechanical Penetration Room; Auxiliary Building 543 foot elevation, Room 227
- Main Control Room; Auxiliary Building 594 foot elevation, Room 573
- Unit 1 Exterior Doghouse; All elevations
- Unit 2 Auxiliary Feedwater (CA) Pump Room and the 2A and 2B motor driven CA pump pits; Auxiliary Building 543 foot elevation, Rooms 260, 265, and 266
- Auxiliary Building 522 foot elevation, Rooms 100 through 112

b. Findings

No findings of significance were identified.

1R06 Flood Protection Measures

.1 External Areas

a. Inspection Scope

The inspectors reviewed the licensee's external flood protection features. The inspectors performed a walkdown of external site areas, focusing on all the designated Type I inlet catch basins on-site, which are part of the surface water drainage system that is designed to protect all safety-related facilities from flooding during a local probable maximum precipitation. This included observing that steel grating on four sides and top of the basins was intact, free of debris accumulation and prevented significant blockage of the drains. The inspectors reviewed the corrective action program

documents to verify that the licensee was identifying issues and resolving them. The documents reviewed during this inspection are listed in the Attachment to this report.

b. Findings

No findings of significance were identified.

.2 Internal Areas

a. Inspection Scope

The inspectors reviewed the Updated Final Safety Analysis Report, Individual Plant Examination, and flood analysis documentation associated with internal plant areas to determine the effect of flooding. The inspectors reviewed the licensee's internal flood protection features for the following two areas for the annual sample:

- Interface between the service building, turbine buildings and auxiliary buildings designed to protect against flooding caused by the rupture of piping or components associated with the Circulating Water System
- Flood mitigation and control measures on the 522 foot elevation of the auxiliary building designed to protect against flooding from pipe breaks in higher elevations of the auxiliary building or a rupture of the Refueling Water Storage Tank (FWST)

The internal areas were selected and walked down based on the flood analysis calculations. Through observation and design review, the inspectors reviewed sealing of doors, holes in elevation penetrations, sump pump operations, and potential flooding sources. The inspectors reviewed corrective action program documents to verify that the licensee was identifying issues and resolving them. Documents reviewed during this inspection are listed in the Attachment to this report.

b. Findings

No findings of significance were identified.

1R07 Heat Sink Performance (Annual Inspection)

a. Inspection Scope

The inspectors observed the performance of PT/1/A/4400/006 A, Containment Spray (NS) Heat Exchanger 1A Heat Capacity Test, and evaluated the test data for acceptable performance. The inspectors also conducted discussions with test personnel concerning system configuration and heat load requirements, the methodology used in calculating heat exchanger performance, and the method for tracking the status of tube plugging activities via the data logger and computer processing equipment. The documents reviewed during this inspection are listed in the Attachment to this report.

b. Findings

No findings of significance were identified.

1R11 Licensed Operator Regualificationa. Inspection Scope

The inspectors observed Active Simulator Exam Scenario 45 to assess the performance of licensed operators. The exercise included the failure of a reactor coolant system narrow range cold leg temperature instrument, the failure of the reactor to automatically trip when required, and a steam generator tube leak that transitioned to a tube rupture. The inspection focused on high-risk operator actions performed during implementation of the abnormal and emergency operating procedures, and the incorporation of lessons-learned from previous plant events. Through observations of the critique conducted by training instructors following the exam session, the inspectors assessed whether appropriate feedback was provided to the licensed operators regarding identified weaknesses. The documents reviewed during this inspection are listed in the Attachment to this report.

b. Findings

No findings of significance were identified.

1R12 Maintenance Effectivenessa. Inspection Scope

The inspectors reviewed the licensee's effectiveness in performing the five maintenance activities listed below. This review included an assessment of the licensee's practices pertaining to the identification, scope, and handling of degraded equipment conditions, as well as common cause failure evaluations and the resolution of historical equipment problems. For those structures, systems, and components (SSCs) scoped in the maintenance rule per 10 CFR 50.65, the inspectors assessed whether reliability and unavailability were properly monitored, and that 10 CFR 50.65 (a)(1) and (a)(2) classifications were justified in light of the reviewed degraded equipment condition. The documents reviewed during this inspection are listed in the Attachment to this report.

- Replacement of a faulty Digital Reference Unit associated with the governor on the 2B DG identified during post-maintenance testing after inspections of the connecting rod bearing shells were conducted
- Repair of the inboard containment isolation valve in the Containment Air Release system (1VQ-2A) which failed in the intermediate position while performing quarterly stroke testing
- Replacement of the three linear reactor transformers associated with the 1A DG voltage regulator circuitry, one of which had overheated and caused 1A DG to trip during an operability test
- Replacement of the 2D Loop Delta T Deviation Alarm Signal Comparator Circuit card following receipt of several annunciator alarms with no actual deviation condition existing in the affected loop
- Replacement of the damaged normal supply 1LXC feeder breaker to the 1A Main Transformer "A" cooling bank fans while providing sufficient cooling to the transformer to maintain 100 percent turbine generator output utilizing temporary power for the affected fans

b. Findings

No findings of significance were identified.

1R13 Maintenance Risk Assessments and Emergent Work Evaluation

a. Inspection Scope

The inspectors reviewed the licensee's assessments concerning the risk impact of removing from service those components associated with the 11 work items listed below. This review primarily focused on activities determined to be risk-significant within the Maintenance Rule. The inspectors also assessed the adequacy of the licensee's identification and resolution of problems associated with maintenance risk assessments and emergent work activities. The inspectors reviewed Nuclear System Directive (NSD) 415, Operational Risk Management (Modes 1-3), and NSD 403, Shutdown Risk Management (Modes 4,5,6, and No Mode), for appropriate guidance to comply with 10 CFR 50.65 (a)(4). The documents reviewed during this inspection are listed in the Attachment to this report.

- Review of planned activities and emergent work upon notification of failure of 1A DG operability test on April 10, 2007
- Review of planned and emergent work for the period the "A" RN supply header was exposed for excavation and inspection scheduled for April 12 - 15, 2007
- Review of planned activities and emergent work following the identification of a faulty Digital Reference Unit on the 2B DG on April 16, 2007
- Review of planned and emergent work activities during the period Unit 2 was in an Orange risk condition as a result of tube cleaning on the 2B KC heat exchanger on April 24, 2007
- Review of planned work scope for the excavation and inspection of the "A" and "B" RN supply headers and then the implementation of the plan during the period of April 25 - 29, 2007
- Review of planned and emergent work activities following the failure and subsequent replacement of the 2B Solid State Protection System (SSPS) 48 VDC Power Supply (PS-2) on May 11, 2007
- Review of planned and emergent work activities during the period Unit 1 was in an Orange risk condition as a result of tube cleaning on the 1A KC heat exchanger on June 4, 2007
- Review of planned and emergent work activities during the 5-day period when the Unit 1 DG RN Crossover piping was being installed from May 21 to May 26, 2007
- Review of planned and emergent work activities during the period when the 1A Main Transformer normal feeder breaker to Bank "A" cooling fans was replaced and temporary power to the fans was utilized on June 16, 2007
- Review of planned and emergent work activities following the failure of the "E" VI air dryer and resulting unanticipated drop in instrument air system pressure that occurred on June 23, 2007
- Management of the increased overall unit risk during the cleaning of the 2A KC heat exchanger that occurred on June 28, 2007, including the development of a Critical Maintenance Plan, implementation of the plan, protection of opposite-train equipment, providing management oversight of the maintenance, and timely completion of the work

b. Findings(1) Inadequate Implementation of Risk Management Actions Associated With Planned Maintenance on the Unit 2 B Train KC Heat Exchanger

Introduction: Inspectors identified a Green NCV of 10 CFR 50.65(a)(4) for the licensee's failure to effectively implement the risk mitigation actions contained in the approved Critical Evolution Plan associated with work on the Unit 2 B Train KC heat exchanger to manage and minimize the resulting increased plant risk.

Description: On April 24, 2007, the Unit 2 KC system Train B was removed from service to allow the heat exchanger tubes to be cleaned. This alignment placed Unit 2 in an Orange risk condition for approximately 15 hours. At Catawba, the only planned maintenance that results in an Orange risk condition is the cleaning of the KC heat exchangers. Due to the water quality of Lake Wylie, the KC heat exchangers have required frequent, routine cleaning since 2003. The licensee has developed Critical Maintenance Plans for each of the heat exchangers to allow the cleaning to be performed while minimizing the increased risk resulting from removing an individual train of KC from service. The cleaning of the Unit 2 B Train KC heat exchanger had been planned to be performed during the "B" train work week of April 23, 2007. The approved Critical Evolution Plan contained compensatory measures to be implemented during the cleaning to ensure the opposite train would be appropriately protected. In addition, the plan contained a section of Risk Management Actions which contained additional controls to provide awareness, control, and management of the risk resulting from the work.

The Unit 2 B Train KC heat exchanger was removed from service at 2:45 a.m., on April 24, 2007, and the tube cleaning commenced shortly after the heat exchanger was drained. The inspectors conducted a review of in-plant equipment listed in the Critical Evolution Plan that was to be protected and found that all postings or barriers were in-place as required. The inspectors then went to verify that the postings were in-place at the switchyard based on the following statements contained in the Critical Evolution Plan:

- The Unit 2 A Train 4.16kV vital switchgear and its associated sources shall be protected
- The Duty Work Week Manager will ensure that there is no switchyard work on the schedule
- The Operations Shift Manager (OSM) will ensure that the switchyard is protected utilizing Operation's administrative guidance for protected equipment.

The inspectors noted that the switchyard was not protected as required. Additionally, two groups were observed to be performing work inside of the fenced area surrounding the switchyard. One group was conducting grounding-mat inspections and the other was replacing event recorders as part of a corrective action associated with the May 2006 Loss of Offsite Power (LOOP) that had started the previous week. A truck was observed in the switchyard supporting the event recorder work, as well as multiple personal vehicles which had been driven into the switchyard and parked. The Work Control Center (WCC) Senior Reactor Operator (SRO) was unaware of the work taking place in the switchyard due to the fact that neither group had contacted the WCC prior to starting work that morning. The event recorder team had called the control room to

inform them that the work that had been started the previous week would be continuing. However, this activity was not communicated to the WCC SRO at the time the control room was notified. The WCC SRO discussed the situation with the OSM, who directed that all work activities in the switchyard be suspended and the personnel vacate the area. The vehicles were then driven out of the switchyard rather than leaving them safely alone until the KC heat exchanger tube cleaning was completed.

On the same day, site security was conducting aviation training in conjunction with the South Carolina State Law Enforcement Division. Two helicopters were brought on-site as part of this training. In discussions with the WCC SRO, the inspectors determined that avoiding flying in close proximity to the 230kV lines and switchyard had not been considered in terms of providing the pilots with an exclusion zone based on the Orange risk condition of the unit. The WCC SRO contacted Security and a new flight path was developed for the two helicopters which incorporated the requirement of remaining clear of the offsite electrical sources.

The Unit 2 B Train KC heat exchanger was returned to service and the Orange risk condition exited at 10:30 p.m., on April 24, 2007.

Analysis: The performance deficiency associated with this issue was the failure to effectively manage the increased risk associated with planned cleaning of the Unit 2 B Train KC heat exchanger tubes through the inadequate implementation of the Critical Evolution plan developed and approved to support the activity. The following aspects demonstrate this performance deficiency:

- The Critical Maintenance Plan for the Unit 2 B Train KC heat exchanger tube cleaning contained a section entitled “Actions to Minimize the Magnitude of Risk Increase.” Within that section, actions listed included protecting the switchyard and not permitting work to be performed in the area. Contrary to these requirements, the switchyard had not been protected when the Unit 2 B Train KC system was removed from service and two separate activities were being conducted in the switchyard during the period when Unit 2 was in an Orange risk condition. To support these activities, a truck and multiple personal vehicles had also entered the switchyard and were parked inside the protective fence.
- During the period the Unit 2 B Train KC system was removed from service, Security had scheduled helicopter flights around the site in conjunction with South Carolina State Law Enforcement Division. An exclusion zone around the switchyard and 230kV transmission lines had not been established and communicated to the pilots prior to their arrival at Catawba.

The finding was more than minor because it was associated with the Equipment Performance attribute of the Mitigating Systems cornerstone and affected the cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences is maintained. During the cleaning of the Unit 2 B Train KC heat exchanger tubes, the offsite power supply was not protected and in fact, work was conducted within the switchyard’s protective fence.

The inspectors completed a Phase 1 screening of the finding using Appendix K of Inspection Manual Chapter 0609, “Maintenance Risk Assessment and Risk Significance

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Determination Process,” and determined that the performance deficiency represented a finding of very low safety significance (Green) based on the resulting magnitude of the calculated Incremental Core Damage Probability associated with the work being performed in the switchyard in conjunction with the Unit 2 B Train KC heat exchanger tube cleaning being less than 1E-6.

This finding has been entered into the licensee’s Corrective Action Program as PIP C-07-2025. The finding directly involved the cross-cutting area of Human Performance under the “Work Activity Coordination” aspect of the “Work Control” component, in that the licensee failed to appropriately coordinate work activities to ensure the operational impact of the planned work was controlled and the increased risk minimized in accordance with the approved Critical Evolution Plan associated with the cleaning of the Unit 2 B train of KC.

Enforcement: 10 CFR 50.65(a)(4), “Requirements for monitoring the effectiveness of maintenance at nuclear power plants,” requires in part, that prior to performing maintenance activities, the licensee shall assess and manage the increase in risk that may result from the proposed maintenance activities. NSD 415, “Operational Risk Management (Modes 1-3) per 10 CFR 50.65(a)(4), implements the requirements set forth in 10FR50.65(a)(4) during power operation. NSD 213, “Risk Management Process”, defines the requirements of station personnel to identify, direct, control and manage risk-significant activities at the station, including the development of Critical Evolution Plans to manage and minimize the risk resulting from the planned activity.

Contrary to the above, on April 24, 2007, the licensee inadequately managed the increased risk associated with the cleaning of the tubes in the Unit 2 B Train KC heat exchanger by failing to fully implement the risk management actions contained in the approved Critical Evolution Plan for the activity. Because this finding is of very low safety significance and has been entered into the licensee’s corrective action program as PIP C-07-2025, this violation is being treated as an NCV consistent with Section VI.A of the NRC Enforcement Policy: NCV 05000414/2007003-01, Inadequate Implementation of Risk Management Actions Associated With Planned Maintenance on the Unit 2 B Train KC Heat Exchanger.

(2) Inadequate Implementation of Risk Management Actions Associated With the Excavation of the RN Supply Headers

Introduction: Inspectors identified a Green NCV of 10 CFR 50.65(a)(4) for the licensee’s failure to develop and implement an effective Complex Evolution Plan associated with excavation and inspection of the RN supply headers in order to manage and minimize the risk associated with the activity.

Description: On April 26, 2006, the A and B RN supply headers were excavated to allow for inspection and recoating activities to be performed. While the activity itself placed both units in a Yellow risk condition, damage to either header would have resulted in a loss of one train of RN on both units.

Catawba has implemented a multi-year project to inspect and repair the RN supply and discharge headers due to accelerated corrosion affecting the structural integrity of the piping. Part of this project involves excavating the buried headers in 30 to 50 foot segments. During the period of April 26 through 30, 2007, approximately 30 feet of the

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RN supply headers were scheduled to be uncovered, inspected, repaired (if required), recoated, and reburied. Based on the increased risk resulting from exposing both RN supply headers, NSD 213, "Risk Management Process", dictated that a Complex Evolution Plan be developed to support the activity. The Complex Evolution Plan contained compensatory measures to be implemented during the maintenance to minimize the potential of damaging the headers throughout the evolution.

The excavation started at midnight on April 26, 2007, and the first portion of the headers was exposed by 5:00 a.m. A review of the Risk Management Actions section of the Complex Evolution Plan identified the following risk mitigation strategy intended to prevent inadvertently damaging the supply headers or the outer coating during the excavation portion of the activity:

- To prevent the bucket on the track hoe from contacting the pipe, a less intrusive digging method will be used when working close to the pipe. This will include the use of hand digging and vacuuming of fill material as required.

At 7:30 a.m., the inspectors observed that a track hoe was being used to excavate the compacted soil between the two supply headers. Based on the width of the track hoe's bucket and the distance between the two headers, less than 8 inches of clearance existed between the bucket and the headers. This practice, in light of the risk mitigation strategy contained in the approved Complex Evolution Plan, was discussed with the project manager. The project manager directed all mechanized excavating be suspended until the plan could be reviewed by engineering and additional guidance provided to minimize the risk resulting from digging in close proximity to the RN supply headers.

At approximately 12:30 p.m., the inspectors returned to the excavation site and again noted that the track hoe was being used to excavate the compacted soil. The bucket was observed to be coming within 1 to 2 inches of the supply headers. Licensee management was contacted and work was again halted until the plan was revised to support limited use of the track hoe in the excavation phase of the work.

After considerable discussion between the Service Water Project management team, Civil Engineering, Operations, and station management, the Complex Evolution Plan was revised to contain the following guidance:

- When working close to the headers, less intrusive methods of digging shall be used. A mini-excavator working with the assistance of a Duke qualified competent person (spotter) may be used to remove soil within a reasonable proximity of the pipe walls (no less than 3 inches). Soil closer to the pipe walls will be removed by hand digging utilizing tools such as shovels, clay spades, etc., along with vacuum hoses from vacuum trucks. When excavating between the pipes, the path of the mini-excavator bucket shall be maintained along the approximate centerline of the space between the headers. The mini-excavator shall not use a bucket larger than one foot in width. Pneumatic spades may be used to loosen weather rock on the bottom of the excavation but not closer than approximately one foot from the pipe walls.

Once the plan had been revised, appropriately reviewed and approved, work was recommenced with additional supervisory oversight.

Analysis: The performance deficiency associated with this issue was the licensee's failure to develop and implement an effective risk management plan to control the risk associated with the excavation of the RN supply headers. The following aspects demonstrate this performance deficiency:

- While the Complex Evolution Plan contained instructions to use less-intrusive digging methods when working near the RN headers, the guidance lacked the specificity needed to ensure the actions intended by the plan were appropriately implemented in the field. Contrary to the risk management action contained in the plan, personnel excavating the headers used a track hoe to remove the compacted soil surrounding the headers resulting in the bucket coming in close proximity to both supply headers. The job-site supervisor interpreted the risk management action inappropriately and allowed the mechanized excavation to take place in close proximity to the two RN supply headers.
- Following identification of the aforementioned work practice, the use of mechanized equipment to excavate the soil from around the headers was suspended pending an engineering assessment of the practice and a revision of the Complex Evolution Plan. Contrary to these planned actions, excavation resumed at the work site using the track hoe before the assessment was performed or plan revised. The inspectors noted that the track hoe bucket was again being operated in close proximity to the headers during the excavation.

The finding was more than minor because it was associated with the Equipment Performance attribute of the Mitigating Systems cornerstone and affected the cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences is maintained. During the excavation phase of the activity, the potential of damaging the RN headers was not adequately controlled to minimize the increased risk resulting from the excavation.

The inspectors completed a Phase 1 screening of the finding using Appendix K of Inspection Manual Chapter 0609, "Maintenance Risk Assessment and Risk Significance Determination Process," and determined that the performance deficiency represented a finding of very low safety significance (Green) on the basis that in the event an RN supply header was damaged during the excavation, the licensee could complete repairs to the header within the TS allowable out-of-service time of 72 hours.

This finding has been entered into the licensee's Corrective Action Program under PIP C-07-2079. The finding directly involved the cross-cutting area of Human Performance under the "Supervisory and Management Oversight" aspect of the "Work Practices" component, in that the licensee failed to ensure that the appropriate level of supervisory oversight was provided during the excavation phase to ensure the expectations pertaining to the use of mechanized equipment when digging in close proximity to the RN supply headers were properly implemented.

Enforcement: 10 CFR 50.65(a)(4), "Requirements for monitoring the effectiveness of maintenance at nuclear power plants," requires in part, that prior to performing maintenance activities, the licensee shall assess and manage the increase in risk that may result from the proposed maintenance activities. NSD 415, "Operational Risk Management (Modes 1-3) per 10 CFR 50.65(a)(4), implements the requirements set

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forth in 10FR50.65(a)(4) during power operation. NSD 213, "Risk Management Process," defines the requirements of station personnel to identify, direct, control and manage risk-significant activities at the station, including the development of Complex Activity Plans to manage and minimize the risk resulting from the planned activity.

Contrary to the above, on April 26, 2007, the licensee failed to develop and implement an effective Complex Evolution Plan to manage the increased risk associated with the excavation of the RN supply headers. Because this finding is of very low safety significance and has been entered into the licensee's corrective action program as PIP C-07-2079, this violation is being treated as an NCV consistent with Section VI.A of the NRC Enforcement Policy: NCV 05000413,414/2007003-02, Inadequate Implementation of Risk Management Actions Associated with the Excavation of the RN Supply Headers.

## 1R15 Operability Evaluations

### a. Inspection Scope

For the ten operability evaluations listed below, the inspectors evaluated the technical adequacy of the evaluations to ensure that Technical Specification (TS) operability was properly justified and the subject component or system remained available such that no unrecognized increase in risk occurred. The inspectors reviewed the Updated Final Safety Analysis Report (UFSAR) to verify that the system or component remained available to perform its intended function. In addition, the inspectors reviewed compensatory measures implemented to verify that they worked as stated and that they were adequately controlled. The inspectors also reviewed a sampling of PIPs to verify that the licensee was identifying and correcting any deficiencies associated with operability evaluations. The documents reviewed during this inspection are listed in the Attachment to this report.

- PIP C-07-1628, Cotter pin found missing from a connecting rod bolt in the #1 cylinder on the 2A DG
- PIP C-07-1387, Missing reinforcing pad on weld 2RN10-2 at the 4-inch branch connection to the assured make-up supply to the 1B KC surge tank from the 20-inch RN supply header
- PIP C-06-7496, During construction of piles for the Independent Spent Fuel Storage Installation (ISFSI) haul path bridge over the RN supply and return headers, a 2.5-inch diameter threaded rod was not placed to the depth specified on the drawing
- PIP C-07-1837, Failure of the Digital Reference Unit on the 2B DG resulted in the generator being operated at greater than 5750kW
- PIP C-07-1682, Unplanned TS entry due to the Standby Shutdown Facility (SSF) being declared inoperable because of the DG output breaker not operating as expected
- PIP C-07-1941, Loss of normal letdown on Unit 2 due to valve 2NV-125B closing during Auxiliary Safeguards Testing due to a Procedure Use and Adherence issue
- PIP C-07-02203, During performance of Unit 1 SSF American Society of Mechanical Engineers. Section 11, Valve Performance Test, indicated flow was erratic requiring securing the pump, performing additional venting, and re-running the pump
- PIP C-07-02695, Loose nut on piping support 2-R-RN-0240 associated with the RN supply to the 2A DG Jacket Water Cooling (KD) Heat Exchanger

- PIP C-07-2773, Unexpected alarm received on the 2A DG annunciator panel
- PIP C-07-3163, Unit 2 FWST level channel 3 came into alarm unexpectedly during a period of thunderstorm and lighting activity in the area of Catawba resulting in a Technical Specification Action Item Log (TSAIL) entry

b. Findings

No findings of significance were identified.

1R17 Permanent Plant Modifications

a. Inspection Scope

The inspectors reviewed the following two permanent plant modifications to verify the adequacy of the modification packages, and to evaluate the modifications for adverse affects on system availability, reliability, and functional capability. Documents reviewed during this inspection are listed in the Attachment to this report.

- Replacement of obsolete containment hydrogen igniter glow plugs with glow coils (Modification Packages CN-11438 / CN-21438)
- Reinforcement of the Unit 1 and Unit 2 Fuel Handling Cask Crane bridge girders in response to a Part 21 Notice received from Whiting Corporation (Modification Packages CD-101003 / CD-201004)

b. Findings

(1) Inadequate Design and Implementation of Modifications to the Hydrogen Igniter System on Catawba Units 1 and 2

Introduction: Inspectors identified a Green NCV of 10 CFR 50, Appendix B, Criterion III, Design Control, for the licensee's failure to effectively design and implement a modification that replaced the containment hydrogen ignition system's glow plugs with upgraded glow coils to ensure the system's operability was maintained.

Description: In early-2004, Catawba developed and approved a plant modification to replace the existing glow plugs in the hydrogen ignition system (HIS) with upgraded glow coils due to the obsolescence of the glow plugs. The modifications were installed on Unit 2 during the fall 2004 End-of-Cycle (EOC) 13 refueling outage and on Unit 1 during the spring 2005 EOC15 refueling outage.

In mid-2006, some of the 30-amp breakers which had been installed as part of the modification were found to trip after operating for 2 to 3 hours. The Engineering assessment of the condition determined that the breakers required a derating factor to be applied based on the elevated ambient temperature present in the breaker enclosure. This had not been considered during the initial design of the modification although the vendor provided that information in their product manuals. The breakers were upgraded to 40 amps on five of the seven circuits in each train on each unit (20 breakers total) based on the current draw on those specific circuits. No additional assessment of the potential derating of the 30 amp fuses downstream of the breakers was performed at that time.

On December 24, 2006, the licensee initiated a PIP documenting the fact that a 30-amp fuse associated with Unit 1, Train B, Group 4 (one of the seven groups of hydrogen igniters on each train of the HIS) had been found blown twice. The subsequent engineering review of the repetitive fuse failures determined that due to the increased current draw of the new glow coils based on the number of igniters on the circuit and the elevated ambient temperatures in the enclosure housing, the fuses required a derate of their capacity. The 30-amp fuses installed by the modification were undersized and needed to be upgraded to 40-amp fuses. This requirement had not been identified during the development, review, and approval of the original modification package, nor was it part of the review into the 30-amp breakers tripping in mid-2006. All other circuits on both units were checked to verify that the fuses were properly sized. While no additional fuse failures had occurred since the installation of the modification, a total of 20 circuits (five per train, two trains per unit on two units) had their fuses upgraded to 40-amps to ensure sufficient margin was available in the HIS circuits to ensure operability was maintained. The actions taken in response to the undersized breakers and fuses restored both trains of the HIS to operable status on both units by December 26, 2006.

For the circuit associated with the fuse that was found blown twice in December 2006, the licensee assumed the associated circuit (Unit 1, Train B, Group 4) had been inoperable for the entire period since the igniter coils had been installed. As such, they evaluated the operability of the opposite train in the affected group. During this time period, there was a single 25-hour period where the redundant Unit 1 Train A, Group 4 igniters had also been inoperable. A review of the containment hydrogen ignition model used in establishing the location of the igniters and assignment to specific groups determined that all of the igniters in Group 4 were within a single compartment (out of nine) inside of containment that are defined in the hydrogen ignition model. The root cause for this issue was found to be a lack of monitoring and oversight during the development of the modification to replace the HIS glow plugs with the new glow coils, resulting in a modification package being issued that did not address all design aspects.

Analysis: The inspectors determined that the licensee's failure to develop and implement an adequate modification package to ensure the operability of the hydrogen igniter system was maintained following the replacement of the obsolete glow plugs was a performance deficiency. The finding was more than minor because it was associated with the Design Control attribute of the Barrier Integrity cornerstone and affected the cornerstone objective of providing reasonable assurance that a physical design barrier (i.e., containment) would protect the public from radio nuclide releases caused by accidents or events. Following the installation of the hydrogen igniter glow coils, certain breakers and fuses in the individual circuits associated with hydrogen igniters were found to be undersized, resulting in breakers tripping and fuses failing when called upon to provide power to the igniters for extended periods. The inspectors determined the finding to be of very low safety significance (Green) using Manual Chapter 0609, Appendix H, Containment Integrity Significance Determination Process, Phase 2, based on the under-rated breakers or fuses not resulting in the loss of coverage in two adjacent compartments inside of containment. This finding has been entered into the licensee's Corrective Action Program as PIPs C-06-8562 and C-06-8742.

Enforcement: 10 CFR 50, Appendix B, Criterion III, Design Control, requires in part that measures shall be established to assure that applicable regulatory requirements and the design basis for safety-related structures, systems, and components to which this appendix applies are correctly translated into specifications, drawings, procedures, and

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instructions. Design changes, including field changes, shall be subject to design control measures commensurate with those applied to the original design. The design control measures shall provide for verifying or checking the adequacy of the design. Licensee procedures Nuclear System Directive 301, Engineering Change Program, Rev. 29, and Engineering Directives Manual 601; Engineering Change Manual, Rev. 4, define the requirements for station personnel to properly implement the requirements delineated in 10 CFR 50, Appendix B, Criterion III, and provides specific responsibilities for personnel involved in the modification process.

Contrary to the above, in 2004 the licensee failed to correctly translate the design requirements for the HIS into the modification package that replaced the existing hydrogen igniter glow plugs with glow coils on Catawba Unit 1 and Unit 2. This resulted in undersized breakers and fuses being installed in several circuits of igniters, requiring subsequent upgrades of both to be installed. Because this finding is of very low safety significance and has been entered into the licensee's corrective action program as PIPs C-06-8562 and C-06-8742, this violation is being treated as an NCV consistent with Section VI.A of the NRC Enforcement Policy: NCV 05000413,414/2007003-03, Inadequate Design and Implementation of Modifications to the Hydrogen Igniter System on Catawba Units 1 and 2.

(2) Inadequate Test Procedure Used to Verify the Operability of the Hydrogen Igniter System Glow Coils on Catawba Units 1 and 2

Introduction: Inspectors identified a Green NCV of 10 CFR 50, Appendix B, Criterion XI, Test Control, for the licensee's failure to ensure that surveillance procedures were adequate to verify the operability of the newly-installed hydrogen igniter glow coils on Catawba Units 1 and 2.

Description: Catawba is a 4-loop Westinghouse PWR with a low pressure ice condenser containment system. Due to the small containment volume and the lower design pressure of the containment, Catawba is required to have an operable HIS when in Modes 1 or 2. This system, consisting of two trains with 35 igniters in each, is designed to prevent an uncontrolled hydrogen/oxygen reaction from breaching the containment during post accident conditions.

TS Surveillance Requirement 3.6.9.3 requires that each igniter be energized every 18 months and verified to produce a temperature of  $\geq 1700^{\circ}\text{F}$  in order to ensure hydrogen pockets, developed from the release of hydrogen resulting from the fuel cladding/water reaction following an accident, are dissipated prior to reaching explosive concentrations.

In early-2004, Catawba developed a plant modification to replace the existing glow plugs in the HIS with upgraded glow coils due to the obsolescence of the glow plugs. The glow coils were installed on Unit 2 during the Fall 2004 EOC13 refueling outage and on Unit 1 during the Spring 2005 EOC15 refueling outage. Following installation of the glow coils, the surveillance was performed using test procedures developed as part of the 2004 modification package.

During the Fall 2006 1EOC16 refueling outage, it was determined that the test methodology specified in these test procedures was inadequate and had resulted in circuit voltages being set too low and corresponding temperature values being recorded that were non-conservative in nature (i.e., higher than the actual temperature). The

vendor had provided guidance (i.e., within 5 feet) for the distance at which the pyrometer was to be held for measuring temperatures; however, this had not been incorporated into the procedure. As a result, readings were taken at distances that ranged from 3 to 20 feet, with those readings taken at greater than 5 feet being non-conservative. Of the 70 Unit 1 glow coils on both trains, 11 of the 12 coils in the ice condenser were found to have temperatures below the TS allowable value of 1700F. The glow coils on Unit 2, which was in Mode 1 at the time, were also checked and five of the six coils in the ice condenser on the 2A train of the HIS were found to not meet the TS surveillance requirement acceptance criteria. The licensee took immediate actions to increase the voltage on the individual glow coil circuits and subsequently verified that the actual temperatures for all igniter coils were above the TS value of 1700F on both units. Operability on both units was restored by December 26, 2006. The lowest actual temperatures found were 1612F (Unit 1, HIS train A), 1657F (Unit 1, HIS train B) and 1650F (Unit 2, HIS train A). While these temperatures were below the TS required acceptance criteria of 1700F, it was demonstrated that sufficient temperatures ( $\geq 1500\text{F}$ ) for hydrogen ignition would have been generated based on the line voltages present since they had been installed.

The root cause for this issue was found to be the failure to ensure test equipment limitations were identified and incorporated into plant procedures prior to issuing the procedures for use.

Analysis: The inspectors determined that the licensee's failure to incorporate the test equipment vendor's guidance into the surveillance procedures used to verify operability of a safety-related structure, system or component (SSC's) was a performance deficiency. The finding was more than minor because it was associated with the Procedure Quality attribute of the Barrier Integrity cornerstone and affected the cornerstone objective of providing reasonable assurance that a physical design barrier (i.e., containment) would protect the public from radio nuclide releases caused by accidents or events by approving and using a procedure that failed to ensure the required glow coil temperatures were produced by all installed hydrogen igniters. The inspectors determined the finding to be of very low safety significance using the Phase 1 Screening Worksheet of Inspection Manual Chapter 0609, "Maintenance Risk Assessment and Risk Significance Determination Process," based on the actual temperatures of the affected hydrogen igniters being above the value that was subsequently shown to result in hydrogen ignition. This finding has been entered into the licensee's Corrective Action Program as PIP C-06-8562. The finding directly involved the cross-cutting area of Human Performance under the "Complete and Accurate Procedures" aspect of the "Resources" component, in that the licensee failed to develop an adequate surveillance procedure to ensure voltages on hydrogen igniter glow coil circuits would produce temperatures that met the acceptance criteria specified in the TS.

Enforcement: 10 CFR 50, Appendix B, Criterion XI, Test Control, requires in part that a test program be established to assure all testing required to demonstrate that SSCs will perform satisfactorily in service is identified and performed in accordance with written test procedures which incorporate the requirements and acceptance criteria contained in applicable design documents. In addition, test procedures shall include provisions to assure that adequate test instrumentation is available and properly used.

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Contrary to the above, in 2004, the licensee failed to correctly develop adequate test procedures to ensure the voltages on the circuits associated with the newly-installed hydrogen igniter glow coils were set properly to produce temperatures at or above the values specified in the TS required for operability. As a result, some igniter coils in both trains on Unit 1 and the A train on Unit 2 were found to be at temperatures below the minimum TS value. Because this finding is of very low safety significance and has been entered into the licensee's corrective action program as PIP C-06-8562, this violation is being treated as an NCV consistent with Section VI.A of the NRC Enforcement Policy: NCV 05000413,414/2007003-04, Inadequate Test Procedure Used to Verify the Operability of the Hydrogen Igniter System Glow Coils on Catawba Units 1 and 2.

(3) Failure to Perform Required Weld Inspections on the Fuel Handling Cask Cranes

Introduction: Inspectors identified a Green NCV of 10 CFR 50, Appendix B, Criterion III, Design Control for the licensee's failure to effectively implement the requirement to fully inspect fuel handling cask crane welds in accordance with UFSAR Section 9.1.4.2.3 following reinforcements made in response to a Part 21 notification.

Description: On March 30, 2006, Whiting Corporation issued a Part 21 notification after performing a crane design analyses and study that identified two overstress conditions on certain bridges and trolleys. For Catawba Nuclear Station, potential structural concerns associated with the Unit 1 and Unit 2 125-ton fuel handling cask cranes were identified, resulting in a 50 percent derate being applied until the cranes could be fully evaluated and upgraded if required. Following an evaluation, the licensee determined that the Catawba fuel handling cask crane bridge girders needed to be reinforced on the ends near the wheel trucks in order to return the rated capacity of the cranes to 125 tons. Section 9.1.4.2.3 of the UFSAR required all structural welds for the bridge, trucks, drums, and trolley to be 100 percent inspected by magnetic particle or liquid penetrant testing. The licensee implemented the modifications to the Unit 1 and Unit 2 cranes prior to the first NRC ISFSI inspection. During the inspection completed on April 13, 2007, inspectors found that the required weld inspection criteria was missed and only visual inspections had been performed on the weld reinforcements. The licensee immediately derated the Unit 1 and Unit 2 cranes back to 50 percent until the welds could be reinspected by liquid penetrant testing. Scaffolding was erected to access the fuel handling cask cranes and liquid penetrant testing was performed on the affected welds.

Analysis: The inspectors determined that the failure to implement the requirement to fully inspect the fuel handling cask crane weld reinforcements in accordance with UFSAR Section 9.1.4.2.3 was a performance deficiency. The finding was more than minor because if left uncorrected it could become a more significant safety concern in that improperly performed inspections on fuel handling equipment could impact the safe movement of nuclear fuel and increase the probability of a fuel handling accident. This finding is associated with the Equipment Performance attribute of the Initiating Events cornerstone and affected the cornerstone objective of limiting the likelihood of an event that could challenge critical safety functions during spent fuel movement. The finding is not suitable for SDP evaluation, but has been reviewed by NRC management and is determined to be a finding of very low safety significance (Green) because the affected welds on the fuel handling cask cranes were properly inspected, with no problems identified, prior to lifting fully loaded fuel casks in the spent fuel pool building. The finding directly involved the cross-cutting area of Problem Identification and Resolution

under the “Operating Experience Evaluation” aspect of the “Operating Experience” component, in that the licensee failed to properly evaluate the Part 21 notification received from Whiting Corporation to ensure all testing requirements were identified prior to implementing the required modification and declaring the cranes fully operable.

Enforcement: 10 CFR 50, Appendix B, Criterion III states, in part that, design changes, including field changes, shall be subject to design control measures commensurate with those applied to the original design, such as specified in the UFSAR TP. Contrary to the above, on April 13, 2007, NRC inspectors identified that the licensee failed to implement the requirements of the UFSAR by not fully inspecting the reinforced structural welds of the fuel handling cask crane by liquid penetrant testing. Because this finding is of very low safety significance and has been entered into the licensee’s corrective action program as PIP C-07-2028, this violation is being treated as an NCV consistent with Section VI.A of the NRC Enforcement Policy: NCV 05000413,414/2007003-05, Failure to Perform Required Weld Inspections on the Fuel Handling Cask Cranes.

#### 1R19 Post-Maintenance Testing

##### a. Inspection Scope

The inspectors reviewed the five post-maintenance tests listed below to verify that procedures and test activities ensured system operability and functional capability. The inspectors reviewed the licensee’s test procedures to verify that the procedures adequately tested the safety function(s) that may have been affected by the maintenance activities, that the acceptance criteria in the procedures were consistent with information in the applicable licensing basis and/or design basis documents, and that the procedures had been properly reviewed and approved. The inspectors also witnessed the tests and/or reviewed the test data to verify that test results adequately demonstrated restoration of the affected safety function(s). The documents reviewed during this inspection are listed in the Attachment to this report.

- Operability Test on the 2A DG following bearing inspections using PT/2/A/4350/002A
- In-Service Test on the 2A Chemical/Volume Control System (NV) pump following preventive maintenance activities
- SSF DG loading following SSF breaker console switch replacement due to the close push button requiring several attempts to close the DG breaker
- Testing of the Unit 2 B Train SSPS following replacement of a failed 48VDC power supply and an Over-temperature/Delta Temperature Protection Cabinet card
- Stroke time testing of valve 2RN-38B, RN pump 2B discharge isolation valve, following preventive maintenance activities

##### b. Findings

No findings of significance were identified.

#### 1R22 Surveillance Testing

##### a. Inspection Scope

The inspectors observed and/or reviewed the seven surveillance tests listed below to verify that TS surveillance requirements and/or Selected Licensee Commitment

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requirements were properly complied with, and that test acceptance criteria were properly specified. The inspectors ascertained whether proper test conditions were established as specified in the procedures, that no equipment pre-conditioning activities occurred, and that acceptance criteria had been met. Additionally, the inspectors also determined if equipment was properly returned to service and if proper testing was specified and conducted to ensure that the equipment could perform its intended safety function. The documents reviewed during this inspection are listed in the Attachment to this report.

#### Surveillance Tests

- PT/1/A/4150/001 D; NC System Leakage Calculation, Rev. 058
- PT/2/A/4450/005B; Containment Air Return Fan 2B and Hydrogen Skimmer Fan 2B Performance Test; Enclosures 13.2, 13.2 and 13.3; Rev. 037
- PT/2/A/4200/013C; RN Valve Test, Enclosure 13.5, Stroke time testing on valve 2RN-38B, RN pump 2B discharge isolation valve, Rev. 050
- PT/1/A/4350/002B; Diesel Generator 1B Operability Test, Rev. 112
- IP/1/A/3240/004G; Intermediate Range N-36 Channel Operational Test, Rev. 060 and IP/0/A/3240/023 NIS Detector Current versus Voltage Curves using CHAR Automatic Characterization System, Rev. 006
- OP/0/A/6450/011; Control Room D/P Verification with Both Outside Air Intakes Open, Rev. 122

#### In-Service Tests

- PT/1/A/4200/004 B; Containment Spray Pump 1A Performance Test, Rev. 058

#### b. Findings

No findings of significance were identified.

### 1R23 Temporary Plant Modifications

#### a. Inspection Scope

The inspectors reviewed the two temporary station modifications listed below to determine whether: the modifications were properly installed; the modifications adversely affected system operability; drawings and procedures were appropriately updated; and post-modification testing was satisfactorily performed. The documents reviewed during this inspection are listed in the Attachment to this report.

- CD-101337: Remove power to prevent motorized operation of the damaged actuator for 1HM-1 (1A & 1B Moisture Separator Reheater (MSR) isolation valve) but still allow the control circuit to automatically control 1HM-2 (1C & 1D MSR isolation valve) and the normal and alternate drains on the MSRs, First Stage Reheater, and Second Stage Reheater drain tanks
- CD-101360: Installation and removal of temporary power to the 1A Main Transformer "A" cooling bank fans while replacing the damaged normal supply 1LXC feeder breaker, which provided sufficient cooling to the transformer to maintain 100 percent turbine generator output

b. Findings

No findings of significance were identified.

Cornerstone: Emergency Preparedness

1EP6 Drill Evaluation

a. Inspection Scope

The inspectors observed and evaluated the licensee's simulated control room and emergency planning performance during a drill conducted on May 24, 2007. The inspectors observed licensee activities occurring in the simulator control room and Technical Support Center during a simulated event. The NRC's assessment focused on the timeliness and accuracy of the event classification, notification of offsite agencies and the overall response of the personnel involved in the drill from an operations and emergency planning perspective. The performance of the emergency response was evaluated against applicable licensee procedures and regulatory requirements. The inspectors attended the post-exercise critique for the drill to evaluate the licensee's self-assessment process for identifying potential deficiencies relating to failures in classification and notification. The inspectors reviewed the completed critique developed by the licensee documenting the overall performance of the Emergency Response Organization. The documents reviewed during this inspection are listed in the Attachment to this report

b. Findings

No findings of significance were identified.

4. Other Activities

4OA1 Performance Indicator Verification

a. Inspection Scope

The inspectors sampled licensee data to verify the accuracy of reported performance indicator (PI) data for the two indicators during periods listed below. To verify the accuracy of the report PI elements, the reviewed data was assessed against PI definitions and guidance contained in Nuclear Energy Institute 99-02, Regulatory Assessment Indicator Guideline, Rev. 4.

Initiating Events

- Unplanned Transients per 7,000 Critical Hours

The inspectors reviewed the Unplanned Transients per 7,000 Critical Hours Performance Indicator results for the period of April 1, 2005 through March 31, 2007 for Unit 2. The inspectors reviewed operating logs, PIPs, and monthly operating reports associated with unplanned changes in reactor power of greater than 20 percent full-power that occurred in that period excluding manual and automatic scrams and

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determined whether the data reported for the PI corresponded to the unit's power profile. The documents reviewed during this inspection are listed in the Attachment to this report.

### Barrier Integrity

- Reactor Coolant System Leakage

The inspectors reviewed the Reactor Coolant System (RCS) Leakage Performance Indicator results for the period of April 1, 2005 through March 31, 2007, for Unit 1. The inspectors reviewed maximum monthly RCS identified leakage calculations compared to TS limiting values. In addition to operating log and record reviews, the inspectors observed the surveillance activity that determines RCS identified leakage rate. The documents reviewed during this inspection are listed in the Attachment to this report.

### b. Findings

No findings of significance were identified.

## 4OA2 Identification and Resolution of Problems

### .1 Daily Review

In accordance with Inspection Procedure 71152, "Identification and Resolution of Problems," and in order to help identify repetitive equipment failures or specific human performance issues for follow-up, the inspectors performed screening of items entered into the licensee's corrective action program. This was accomplished by reviewing copies of PIPs, attending some daily screening meetings, and accessing the licensee's computerized database.

### .2 Annual Sample Review

#### a. Inspection Scope

The inspectors reviewed the cumulative effects of deficiencies that constituted operator workarounds to determine whether or not they could affect the reliability, availability, and potential for mis-operating a mitigating system; affect multiple mitigating systems; or affect the ability of operators to respond in a correct and timely manner to plant transients and accidents. The inspectors also assessed whether operator workarounds were being identified and entered into the licensee's corrective action program at an appropriate threshold.

The inspectors reviewed several PIPs associated with licensee actions intended to correct the issue of the installation and usage of scaffolding near safety-related SSCs. The review looked at improperly installed scaffolds near safety-related SSCs that have been identified over the past 12 months and the corrective actions taken by the licensee to address this issue. Inspectors reviewed corrective action documents, the corporate Duke Power Scaffold manual and plant-specific procedures used in the implementation of the scaffold program. In addition, personnel involved in the erection and periodic inspections of scaffolding were interviewed to determine what actions had been

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implemented and their effectiveness. The inspectors evaluated the scaffolding events and associated corrective actions against the requirements of the licensee's corrective action program and 10 CFR 50, Appendix B. The documents reviewed during this inspection are listed in the Attachment to this report.

b. Findings and Observations

No findings of significance were identified. A Green NCV was issued to the licensee in Inspection Report 05000413,414/2006005 related to ineffective corrective actions that had been taken to address scaffolding issues at the station since mid-2005. The actions that have been implemented since the issuance of the aforementioned Inspection Report have resulted in a significant improvement in the installation and use of scaffolds in the area of safety-related SSCs.

.3 Semi-Annual Review to Identify Trends

a. Inspection Scope

In accordance with Inspection Procedure 71152, "Identification and Resolution of Problems," the inspectors performed a review of the licensee's Corrective Action Program (CAP) and associated documents to identify trends that could indicate the existence of a more significant safety issue. The inspectors' review was focused on repetitive equipment issues, but also considered the results of daily inspector CAP item screenings discussed in section 4OA2.1 above, licensee trending efforts, and licensee human performance results. The inspectors' review primarily considered the six-month period of January 2007 through June 2007, although some examples expanded beyond those dates when the scope of the trend warranted. The review also included issues documented outside the normal CAP in major equipment problem lists, plant health team lists, Independent Nuclear Oversight Team reports, system health reports, self-assessment reports, maintenance rule reports, and Safety Review Group Monthly Reports. The inspectors compared and contrasted their results with the results contained in the licensee's latest quarterly trend reports. Corrective actions associated with a sample of the issues identified in the licensee's trend report were reviewed for adequacy.

b. Assessment and Observations

The inspectors followed the actions being implemented by the licensee in response to the previous inspector-identified trend associated with insufficient management oversight and control of vendors and contractors (non-station personnel). This trend statement has been discussed in the following NRC Inspection Reports 05000413, 414/2005005, 05000413,414/2006003, and 05000413,414/2006005, section 4OA2.3, Semi-Annual Trend Review. Based on the inspectors' initial identification of this trend, the licensee had concluded that a lack of guidance existed in the Duke Nuclear Site Directive 105, Control of Non-Assigned Individuals and Contractor Safety. The licensee stated in corrective action documents generated in response to this adverse trend that this deficiency was evident in large projects undertaken at Catawba, such as the raw water piping project and the refueling outages conducted in 2006, as well as at Oconee during the steam generator replacement project and McGuire during the installation of the new Unit 1 Emergency Core Cooling System sump strainer. Senior Duke Management decided to revise fleet procures to incorporate specific decision points into the planning

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and approval process for major projects to ensure oversight controls are considered and developed as part of an overall project development plan. Station management has recognized the need for additional attention in the area and has implemented interim measures to address this issue for large projects at Catawba. The measures include the development of a Human Performance Improvement Plan directed at non-site assigned personnel, assignment of supervisors qualified to station standards to oversee work activities, provide additional details in oversight plans, and holding daily plan-of-the-day meetings with all crew members conducting work at Catawba. Despite these interim actions however, vendor support has continued to provide challenges to the Catawba organization. For example, during the excavation and inspection of the RN supply headers in April 2007, management's expectations with regard to the use of mechanized digging equipment were not implemented, resulting in increased risk to the station (see Section 1R13b.(2) for details).

Comprehensive changes to the Nuclear Department's formal program for controlling vendor-led projects and providing the necessary oversight were originally planned to be completed by the 3<sup>rd</sup> quarter of 2006; however, this has been delayed several times. As a result, refueling outages at all three Duke nuclear sites have been performed under the existing guidance with the organization being challenged to maintain the appropriate control and oversight of non-station personnel. The Nuclear Site Directive was scheduled to be revised by July 15, 2007; however, its approval has been delayed and a new date for release has not been established.

The residents will continue to monitor actions taken in this area for improvement in the control and oversight of contractor and vendor personnel conducting work at Catawba.

#### 4OA3 Event Followup

##### .1 Emergency Escape Hatches in Unit 1 and Unit 2 Found Unsecured

###### a. Inspection Scope

On June 10, 2007, an unexpected entry into Technical Specifications Limiting Condition for Operations 3.6.14.c (Containment Systems; Divider Barrier Integrity) was made due to the containment submarine hatch on both units found in the unlatched position when checked on weekly operator rounds. These hatches provide emergency egress from lower containment to upper containment; however, if opened, it would provide a pathway that would bypass the ice condenser and result in elevated post-accident containment pressures. They are required to be closed when in Modes 1 to 4. The hatches on both units were found to have their locking mechanism out of position, allowing the hatch to be opened if a higher pressure existed beneath the hatch. The hatches were resecured in the latched position as required. The licensee implemented Fleet and Site security procedures to assess the issue and implemented applicable compensatory actions until the assessment was completed. A formal root cause investigation was initiated to assess the event and develop corrective actions to prevent recurrence. The resident inspectors responded to the initial notification of the event and reviewed the licensee's actions taken in response to the event.

A call was held with the licensee and NRC personnel on June 13, 2007, to discuss actions taken to-date which were deemed appropriate and comprehensive by the NRC personnel on the call. The Resident Inspectors will continue to monitor actions taken by

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the licensee in their on-going investigation of the event and final disposition will be addressed in the closure of the Licensee Event Report (LER) associated with the event.

b. Findings

No findings of significance were identified.

- .2 (Closed) LER 05000413/2006003-00, Technical Specification Violations Associated with Hydrogen Ignition System. On December 15, 2006, the A train of the Unit 2 HIS was declared inoperable as a result of the igniters in the ice condenser region not meeting the TS required value of 1700F due to circuit voltages being set too low. Both the A and B trains on Unit 1 were similarly affected; however, the unit was in a refueling outage and the HIS was not required in that plant configuration. The cause of the improper voltage settings was determined to be caused by guidance in the surveillance procedure failing to address how specified test equipment was to be operated on the new hydrogen igniters. In addition to the temperature issue, it was determined that undersized breakers and fuses had been used when the original modification to upgrade the HIS was installed in the 2004 - 2005 time frame. The LER was reviewed by the inspectors and a detailed assessment of the modification that replaced the obsolete hydrogen igniter glow plugs with glow coils was conducted under Inspection Procedure 71111.17, Permanent Plant Modifications. This assessment is documented in Section 1R17b.(1) and 1R17b.(2) of this report. This LER is closed.
- .3 (Closed) LER 05000414/2004002-00, Manual Reactor Trip Initiated Due to Control Rods from Shutdown Bank D Dropping into the Core. On October 28, 2004, all four control rods in Shutdown Bank D dropped into the core on Unit 2 while at 100 percent power. As a result, the operators manually tripped the reactor in accordance with station procedures and training they had received. Extensive testing of the circuit card associated with this control rod bank failed to identify a problem with the component. Industry operating experience showed that intermittent failures of these cards have occurred at other facilities with similar results (i.e., control rods dropping into the reactor core). The licensee entered this event into their corrective action program as PIP C-04-5878. Corrective actions completed include enhanced operator training related to detecting and responding to a dropped control rod and revised abnormal operating procedures to address a control rod drop event. The long-term reliability of the control rod system will be enhanced through the implementation of a modification to have both the stationary and movable gripper coils remain energized following rod movement. Scheduled implementation of this modification is currently set for the refueling outages in 2009 for both units. This LER is closed.
- .4 (Closed) LER 05000413/2006002-00, Safe Shutdown Potentially Challenged by an External Flooding Event and Inadequate Design and Configuration Control. On May 22, 2006, water overflowed from the Unit 2 cooling towers, transited through underground electrical cable trenches, and entered the 1A DG room resulting in the 1A DG being declared inoperable pending inspections and required repairs. This event was reviewed as part of the Augmented Inspection conducted following the dual-unit LOOP event that occurred on May 20, 2006. The flooding of the 1A DG room was documented as Unresolved Item 05000413/2006009-003 in Inspection Report 05000413,414/2006009 and dispositioned as a Green non-cited violation in Inspection Report 05000413/2006004. This LER is closed.

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#### 4OA6 Meetings, Including Exit

##### .1 Exit Meeting

On July 13, 2007, the resident inspectors presented the inspection results to Mr. G. Hamrick and other members of licensee management, who acknowledged the findings. The inspectors confirmed that all proprietary information provided or examined during the inspection period had been returned.

##### .2 Annual Assessment Meeting Summary

On May 3, 2007, the Chief of Reactor Projects Branch 1 and the Resident Inspectors assigned to the Catawba Nuclear Station (CNS) met with Duke to discuss the NRC's Reactor Oversight Process (ROP) and the NRC's annual assessment of CNS safety performance for the period of January 1, 2006 - December 31, 2006. The major topics addressed were: the NRC's assessment program and the results of the CNS assessment. The meeting was open to the public. A listing of meeting attendees and information presented during the meeting are available from the NRC's document system (ADAMS) as accession number ML072020158. ADAMS is accessible from the NRC Web site at [www.nrc.gov/reading-rm/adams.html](http://www.nrc.gov/reading-rm/adams.html).

ATTACHMENT: SUPPLEMENTAL INFORMATION

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## **SUPPLEMENTAL INFORMATION**

### **KEY POINTS OF CONTACT**

#### Licensee Personnel

E. Beadle, Emergency Planning Manager  
S. Beagles, Chemistry Manager  
W. Byers, Security Manager  
J. Caldwell, Modification Engineering Manager  
G. Cornwell, Project Manager  
J. Ferguson, Mechanical, Civil Engineering Manager  
P. Gillespie, Operations Manager  
G. Hamrick, Engineering Manager  
T. Hamilton, Safety Assurance Manager  
R. Hart, Regulatory Compliance Manager  
L. Keller, Supervisor, Reactor and Electrical Systems  
J. McConnell, Shift Operations Manager  
J. Morris, Catawba Site Vice President  
J. Pitesa, Station Manager  
C. Trezise, Reactor and Electrical Systems Manager

### **LIST OF ITEMS OPENED, CLOSED, AND REVIEWED**

#### Opened and Closed

|                         |     |  |
|-------------------------|-----|--|
| 05000414/2007003-01     | NCV | Inadequate Implementation of Risk Management Actions Associated With Planned Maintenance on the Unit 2 B Train KC Heat Exchanger (Section 1R13b.(1)) |
| 05000413,414/2007003-02 | NCV | Inadequate Implementation of Risk Management Actions Associated With the Excavation of the RN Supply Headers (Section 1R13b.(2))                     |
| 05000413,414/2007003-03 | NCV | Inadequate Design and Implementation of Modifications to the Hydrogen Igniter System on Catawba Units 1 and 2 (Section 1R17b.(1))                    |
| 05000413,414/2007003-04 | NCV | Inadequate Test Procedure Used to Verify the Operability of the Hydrogen Igniter System Glow Coils on Catawba Units 1 and 2 (Section 1R17b.(2))      |
| 05000413,414/2007003-05 | NCV | Failure to Perform Required Weld Inspections on the Fuel Handling Cask Cranes (Section 1R17b.(3))  |

#### Closed

|                     |     |   |
|---------------------|-----|---|
| 05000413/2006003-00 | LER | Technical Specification Violation Associated with Hydrogen Ignition System (Section 4OA3.2) |
|---------------------|-----|---|

|                     |     |   |
|---------------------|-----|---|
| 05000414/2004002-00 | LER | Manual Reactor Trip Initiated Due to Control Rods from Shutdown Bank D Dropping into the Core (Section 4OA3.3)                      |
| 05000413/2006002-00 | LER | Safe Shutdown Potentially Challenged by an External Flooding Event and Inadequate Design and Configuration Control (Section 4OA3.4) |

## LIST OF DOCUMENTS REVIEWED

### Section 1R01: Adverse Weather Preparations

PT/0/B/4700/039, Hot Weather Protection, Rev. 010  
PT/0/B/4700/038, Cold Weather Protection, Rev. 026  
PIP C-07-2096; Ventilation issue related to the supply fan dampers on the 1B RN pump house fan  
PIP C-06-5438; Assess the need to develop and implement a special high temperature hot weather protection inspection procedure  
PIP C-05-6797; Updates or corrections needed for the Hot and Cold Weather Protection procedures  
PIP C-07-2590; NRC walkdown of site hot weather preparation revealed various problems  
Action Register Update Report for Hot Weather Program, dated 5/23/07

### Section 1R04: Equipment Alignment

Critical Evolution Plan for the 1A KC Heat Exchanger Tube Cleaning on 6/4/07  
Critical Evolution Plan for the 2B KC Heat Exchanger Tube Cleaning on 4/24/07  
Catawba Nuclear Station Unit 1 Flow Diagrams of the Component Cooling Water System (KC). Drawings CN-1573-1.0 through CN-1573-1.9 and CN-1573-2.0 through CN-1573-2.3  
OP/1/A/6400/005; Component Cooling Water, Enclosure 4.6, Valve Checklist Outside Containment, Rev. 103  
Open Work Order Report for the Unit 1 KC system, run date of April 23, 2007  
KC System Health Report; 2006T3 and 2007Q1  
PIP C-06-8041; Interactions between KC pump 1A1 and 1A2 following replacement of the 1A1 impeller during 1EOC16  
PIP C-07-2748; 1KC-A84; 1B NS Pump Motor Cooler Outlet Vent Valve; was found to be out of position by an NRC inspector  
Critical Evolution Plan for 1A Main Transformer Bank "A" Normal Feeder Breaker Replacement on 6/16/07  
Critical Activity Plan for the 2A KC Heat Exchanger Tube Cleaning during 07W26

### Section 1R05: Fire Protection

Pre-Fire Plan for Fire Strategy Area 18, Auxiliary Building 577 level, Room 400  
Pre-Fire Plan for Fire Strategy Area 8, Auxiliary Building 560 level, Rooms 372 and 373, 1B Essential Switchgear Room  
Pre-Fire Plan for Fire Strategy Area 20, Auxiliary Building 594 level, Room 576  
Pre-Fire Plan for Fire Strategy Area 4, Auxiliary Building 543 level, Room 227  
Pre-Fire Plan for Fire Strategy Area 21, Auxiliary Building 594 level, Room 573

Pre-Fire Plan for Fire Strategy Area 51, Unit 1 Exterior Doghouse  
 Pre-Fire Plan for Fire Strategy Area 2, Auxiliary Building 543 level, Rooms 260 – 260A  
 Pre-Fire Plan for Fire Strategy Area 1, Auxiliary Building 522 level, Rooms 100 through 112

### **Section 1R06: Flood Protection**

CN-1022-17, Rev. 7; Powerhouse Yard Drainage Layout  
 Catawba USFSAR; Section 2.4; Hydrologic Engineering, dated April 24, 2006  
 PIP C-07-02224; NRC-identified issues associated with Type 1 yard drainage catch basins  
 Catawba UFSAR Chapter 9, Section 9.3.3, Equipment and Floor Drainage System  
 Catawba UFSAR Section 11.2.2.7.2.3, Excessive Leakage in Auxiliary Building Equipment  
 Catawba Design Basis Document Specification CNS-1139.00-00-0001; Section 3.2.1.3.4;  
 Auxiliary Building Generic Design Criteria  
 Catawba Design Basis Document Specification CNS-1139.00-00-0001; Section 3, Table 30;  
 Areas Subject to Pipe Rupture Flooding – Auxiliary Building Structures

### **Section 1R07: Heat Sink Performance**

PT/1/A/4400/006 A; NS Heat Exchanger 1A Heat Capacity Test, Rev. 041  
 PT/1/A/4400/009; Cooling Water Flow Monitoring For Asiatic Clams and Mussels Test, Rev. 065  
 CN-1574-2.0; Flow Diagram of Nuclear Service Water System (RN)

### **Section 1R11: Licensed Operator Requalification**

OP-CN-ASE-45 Active Simulator Exam, Rev. 0

### **Section 1R12: Maintenance Effectiveness**

Work Order 01745999; Repair of 1VQ-2A Containment Purge Inboard Isolation valve  
 PT/1/A/4200/035A, VQ Valve In-service Test, Quarterly  
 PT/1/A/4200/041B; Containment Air Release and Addition Isolation Valve Leak Rate  
 TS 3.6.3  
 PIP C-07-1776; 1VQ-2A went to intermediate position when the open push button was depressed  
 PIP C-07-1837; When performing DG Operability PT, the generator was operated at greater than 5750 kW  
 Work Order 01736420; Replace faulty digital reference unit on the 2B DG  
 PT/2/A/4350/002B; Diesel Generator 2B Operability Test  
 PT/1/A/4350/002A; Diesel Generator 1A Operability Test; Rev. 114  
 PIP C-07-1719; 1A DG tripped during 1A DG Operability PT  
 Engineering Troubleshooting Process Guide in Support of Technical Issue Resolution and Failure Investigation Process Documentation for 1A DG trip on 9 April, 2007  
 PIP C-07-02108; Unexpected entry into TS due to Loop 2D Delta T Deviation alarm  
 PIP C-07-02106; Received Annunciator 2AD-6 C/6 Loop Delta T Deviation  
 Work Order 01748515; Troubleshoot and Replace Loop 2D Delta T Deviation circuit board  
 Work Order 01746597; Supply and Remove Alternate Power for “A” Bank cooling fans and replace failed breaker

### **Section 1R13: Maintenance Risk Assessments and Emergent Work Evaluation**

Daily Work Schedule for 4/16/07 and 4/17/07 following the identification of a faulty Digital Reference Unit on the 2B DG

Critical Evolution Plan for the 2B KC Heat Exchanger Tube Cleaning on 4/24/07

Work Order 01717734; Clean tubes on the 2B KC heat exchanger

OP/2/A/6400/005, Component Cooling Water, Rev. .75, Enclosure 4.8, KC train 2A Alignment for KC HX 2B Cleaning

NSD 213; Risk Management Process, Rev. 6

NSD 415, Operation Risk Management (Modes 1-3) per 10 CFR 50.65(a)(4), Rev. 3

Complex Activity Plan for the 1B Diesel Generator Crossover installation, Execution dates of 5/21/07 through 5/26/07

Work Order 01110942, Installation of the 1B DG RN crossover piping

Critical Activity Plan for the 1A Main Transformer Bank "A" Normal Feeder Breaker Replacement

IP/0/B/3850/024, Temporary Power Installation, Rev. 008

PIP C-07-2047; 07W17 2B KC heat exchanger cleaning critique

TSAIL entry C2-07-00944; KC Train 2B inoperability

OMP 2-18; Equipment Protection and Quarantine, Rev. 66

PIP C-07-2025; The switchyard was not protected during a portion of the 2B KC HX cleaning as required by the Critical Maintenance Plan

Complex Evolution Plan for the "A and "B" Train RN Supply Piping Excavation Phase 3, Dig 1 Plan, Rev. 3, approved 4/18/07

Complex Evolution Plan for the "A and "B" Train RN Supply Piping Excavation Phase 3, Dig 1 Plan, Rev. 4, approved 4/26/07

PIP C-07-2079; Questions associated with the Complex Plan description of the methodology being employed to excavate soil in close proximity to the RN headers

Critical Activity Plan for the 2A KC Heat Exchanger Tube Cleaning during 07W26

OP/2/A/6400/005; Component Cooling System, Enclosure 4.9, KC Train 2B Alignment for KC HX 2A Cleaning

OP/2/A/6400/005; Component Cooling System, Enclosure 4.23, Operator Actions for Loss of Essential Switchgear When Aligned for KC HX Cleaning

AP/2/A/5500/007; Loss of Normal Power, Enclosure 16, S/G Level Control, Rev. 50

Critical Activity Plan for the 1A KC Heat Exchanger Tube Cleaning during 07W23

### **Section 1R15: Operability Evaluations**

PIP C-07-1942; Operations critique on the response to the loss of Unit 2 normal letdown and the implementation of AP-12; Loss of Letdown

Drawing CN-2493-RN.00-040; Diesel Generator Building Nuclear Service Water System

CD200154; Unit 2 RN to KD Crossover Piping Modification

### **Section 1R17: Permanent Plant Modifications**

LER 05000413/2006003-00; TS Violations Associated With the Hydrogen Ignition System

PIP C-07-0108; Evaluate and track changes needed for the Hydrogen Mitigation System EDB records and associated procedures

PIP C-06-8742; Hydrogen igniters 22, 45 and 46 failed S.R. 3.6.9.3 due to inadequate temperatures and fuse FU9 was found to be failed again

PIP C-06-8562; Unexpected entry into TS due to the 2A Hydrogen Igniters being declared inoperable

PIP C-06-8385; Breaker tripped for Unit 1 Hydrogen Igniter group 2B during testing  
 PIP C-07-1811; Unplanned entry into TS due to blown fuse for H2 igniter group 4A affecting 6 igniters  
 PIP C-07-1819; Fuse FU9 was found blown in the Unit 1 H2 mitigation system circuit  
 PIP C-06-8140; Low temperature readings for hydrogen mitigation system igniters  
 PIP C-06-8383; Temperature readings below TS values for hydrogen igniters in certain locations  
 Modification Package CD101003; Unit 1 Fuel Building Cask Crane Upgrades due to 10 CFR 21 issues  
 Modification Package CD201004; Unit 2 Fuel Building Cask Crane Upgrades due to 10 CFR 21 issues  
 PIP C-07-02028; Catawba UFSAR requirement for performing NDE (MT or PT) on structural welds  
 PIP C-07-01922; Open Items resulting from the NRC ISFSI Dry-run Inspection  
 UFSAR Section 9.1.4.2.3  
 Modification Packages CN-11438 / CN-21438; Replace existing hydrogen igniters with new assemblies from Tayco Corporation  
 IP/1(2)/A/3170/001; Hydrogen Mitigation System (EHM) Igniter Temperature Check, Rev. 24 and Rev. 25  
 TS 3.6.9; Hydrogen Ignition System (HIS)  
 Drawing CNEE-0165-02.01; Elementary diagram of Hydrogen Mitigation System (EHM) Igniter Box Group "A", Rev. 5  
 PIP C-06-8742; Hydrogen Igniters 22, 45 and 46 failed SR 3.6.9.3 due to inadequate temperatures.  
 PIP C-06-8562; Unexpected entry into TS due to 2A Hydrogen Igniters being declared inoperable  
 PIP C-07-0243; Duke Power Company Assessment Report on the design adequacy of the hydrogen mitigation system

### **Section 1R19: Post-Maintenance Testing**

PT/2/A/4350/002A, Diesel Generator 2A Operability Test, Rev. 087  
 PT/2/A/4200/007A; Centrifugal Charging Pump 2A Test, Rev. 034  
 TSAIL Entry C2-07-00754 associated with the testing and maintenance activities on the 2A NV pump  
 PIP C-07-1682; Unplanned TS entry due to the SSF being declared inoperable due to the DG output breaker not operating as expected  
 Complex Activity Plan for the replacement of the 2B SSPS 48VDC power supply (PS-2); Rev. 0 and Rev. 1  
 Catawba Unit 2 Unified Control Room logs for the period of 5/10-12/07  
 Complex Maintenance Plan for 2SSPSB Power Supply Replacement  
 WO 01751997, Replacement of 2SSPSB 48VDC Power Supply  
 WO 01128053; Stroke testing of valve 2RN-38B following PM activities  
 Procedure Test Data Sheet for PT/2/A/4200/013C; RN Valve Inservice Test for 2RN-38B

### **Section 1R22: Surveillance Testing**

CN-1563-1.0, Flow Diagram of Containment Spray System (NS)  
 Catawba Unit 1 – CPU A; NC System Leakage Calculation Printouts

### **Section 1R23: Temporary Plant Modifications**

Catawba UFSAR Section 10.4.10; Moisture Separator/ Reheater and Feedwater Drains System  
Work Order 01743438; Disable and Isolate AC Power to 1HM-1 Actuator  
Nuclear System Directive 209; 10 CFR 50.59 Process, Rev. 12

### **Section 1EP6: Drill Evaluation**

Catawba Nuclear Site Critique Summary Report for Drill 07-3  
PIP C-07-2611; Feedback from Emergency Planning Drill conducted on May 24, 2007  
Emergency Response Organization Drill 07-3 Scenario Guide

### **Section 4OA1: Performance Indicator Verification**

PT/1/A/4150/001 D; NC System Leakage Calculation, Rev. 058  
NSD 225, NRC Performance Indicators, Rev. 3

### **Section 4OA2: Identification and Resolution of Problems**

NSD 506; Operator Workaround, Rev. 04  
Operator Workaround List; May 2007  
PIP C-07-00698; Results of routine inspections of Seismic Scaffolds in Aux Bldg  
PIP C-07-01433; Results of first quarter scaffold inspections to date at CNS  
PIP C-07-03296; Results of second quarter scaffold inspections at CNS  
NSD 105, Control of Non-Assigned Individuals and EHS Contractor Safety Process, Rev. 11  
and draft of Rev. 12

### **Section 4OA3: Event Follow-up**

PIP C-07-2911; Unexpected entry into TSAIL for Unit 2 submarine hatch found unsecured  
PIP C-07-2912; Unexpected entry into TSAIL for Unit 1 submarine hatch found unsecured  
LER 05000413/2006003-00; TS Violations Associated With the Hydrogen Ignition System  
PIP C-06-8562; Unexpected entry into TS due to the 2A Hydrogen Igniters being declared inoperable  
PIP C-06-8385; Breaker tripped for Unit 1 Hydrogen Igniter group 2B during testing  
PIP C-07-1811; Unplanned entry into TS due to blown fuse for H2 igniter group 4A affecting 6 igniters  
PIP C-07-1819; Fuse FU9 was found blown in the Unit 1 H2 mitigation system circuit  
PIP C-06-8140; Low temperature readings for hydrogen mitigation system igniters  
PIP C-06-8383; Temperature readings below TS values for hydrogen igniters in certain locations  
IP/1(2)/A/3170/001; Hydrogen Mitigation System (EHM) Igniter Temperature Check, Rev. 24 and Rev. 25  
TS 3.6.9; Hydrogen Ignition System (HIS)  
Drawing CNEE-0165-02.01; Elementary diagram of Hydrogen Mitigation System (EHM) Igniter Box Group "A", Rev. 5  
PIP C-06-8742; Hydrogen Igniters 22, 45 and 46 failed SR 3.6.9.3 due to inadequate temperatures.  
PIP C-06-8562; Unexpected entry into TS due to 2A Hydrogen Igniters being declared inoperable

## LIST OF ACRONYMS

|       |   |   |
|-------|---|---|
| CA    | - | Auxiliary Feedwater                         |
| CAP   | - | Corrective Action Program                   |
| CFR   | - | Code of Federal Regulations                 |
| DG    | - | Diesel Generator                            |
| EOC   | - | End of Cycle                                |
| FW    | - | Refueling Water                             |
| FWST  | - | Refueling Water Storage Tank                |
| HIS   | - | Hydrogen Ignition System                    |
| ISFSI | - | Independent Spent Fuel Storage Installation |
| KC    | - | Component Cooling Water                     |
| KD    | - | Diesel Generator Jacket Water Cooling       |
| LER   | - | Licensee Event Report                       |
| LOOP  | - | Loss of Offsite Power                       |
| MSR   | - | Moisture Separator Reheater                 |
| NC    | - | Reactor Coolant System                      |
| NCV   | - | Non-Cited Violation                         |
| NRC   | - | Nuclear Regulatory Commission               |
| NS    | - | Containment Spray                           |
| NSD   | - | Nuclear System Directive                    |
| NUREG | - | Nuclear Regulations                         |
| NV    | - | Chemical/Volume Control                     |
| OSM   | - | Operations Shift Manager                    |
| PI    | - | Performance Indicator                       |
| PIP   | - | Problem Investigation Process (report)      |
| PM    | - | Preventive Maintenance                      |
| PT    | - | Penetrant Test                              |
| PWR   | - | Pressurized Water Reactor                   |
| RCS   | - | Reactor Coolant System                      |
| RN    | - | Nuclear Service Water                       |
| RTP   | - | Rated Thermal Power                         |
| SDP   | - | Significance Determination Process          |
| SRO   | - | Senior Reactor Operator                     |
| SSCs  | - | Systems, Structures and Components          |
| SSF   | - | Standby Shutdown Facility                   |
| SSPS  | - | Solid State Protection System               |
| TS    | - | Technical Specifications                    |
| TSAIL | - | Technical Specification Action Item Log     |
| UFSAR | - | Updated Final Safety Analysis Report        |
| VI    | - | Instrument Air                              |
| WCC   | - | Work Control Center                         |
| YC    | - | Controlled Area Chilled Water               |